DEPARTMENT OF THE INTERIOR

CANADA

Hon. W. J. Roche, *Minister.* W. W. Cory, C.M.G., *Deputy Minister.*

PUBLICATIONS

OF THE

Dominion Observatory

OTTAWA

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W. F. King, C.M.G., LL.D., *Director.*

Vol. I, No. 15

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BY

J. B. CANNON, M.A.

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(gamma)

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MEASURES OF γ AQUARII.

BY J. B. CANNON, M.A.

The measures of 109 plates of this star follow. Many more plates were taken and measured, but are not included here as the measures of the lines in each were so discordant that no idea of the velocity of the star at the time of taking could be ascertained. In some cases where two plates were taken successively there was so great a difference between the velocities given by the two that both were discarded. What the reason of this may be it is hard to say. In many star spectrograms, certain lines will give velocities quite different from others but unless some evidence is given some time in the cycle of a second spectrum being present, the cause of the divergence in the measures can usually be laid at the door of broad uncertain lines. In this case, however, often the lines are very fair, and yet very poor agreement is found. It is possible that the cause of such disagreement may be due to the presence of a secondary spectrum which our apparatus fails to separate from the primary, yet the effect is such as to form a blend in certain lines which makes the estimation of the velocity indicated very difficult. If this be the case, then we must conclude that the lines present in the secondary are in some instances strong and in others weak, perhaps stronger in some cases and weaker in others than the corresponding lines of the primary.

The star is of A2 type. As will be seen from the measures, the lines of chief importance are H_β, λ 4481, H_γ, H_δ and K. Others appearing are λ 4549, most frequently, and $\lambda\lambda$ 4352, 4300, 4233, 4128, 4045, 4026 very faintly on a few plates. The lines of highest weight are λ 4481, H_γ and K.

A range of 42 km. was obtained quite early in the work on the star and continued observations on it confirmed the fact of its being a binary. Many attempts at various times were made to determine a period but all failed, and more and more plates were secured in the belief that these would make possible the finding of a period. This continued up to the end of October, 1912, and still no period was forthcoming. That which was most satisfactory was 58·1 days, which suited all but about 9 or 10 plates. These plates, however, could not be considered faulty and there was no excuse for discarding them, so the other alternative was to discard 58·1 days as the period. Other periods of 59, 61.25, 29·74, 29·025 days and many others were tried, but, as in the case of 58·1, while the majority of the plates were satisfied, always a sufficient number fell so far from the general outline of the curve as to make the period impossible. For the time at least the star has been omitted from the observing list. A different apparatus might reveal something in the spectrum to solve the difficulty, but with the present, the large number of plates already taken indicates that further observations would not be of any help.

It would seem that the only reason for the inability to arrive at a satisfactory period—notwithstanding a certain considerable range—must be the presence of blends of lines from the components, whose lines vary in intensity and character to such an extent as to make it impossible to estimate the true velocity of the star at the time the plates were taken.

SUMMARY OF MEASURES OF γ AQUARII.

Plate.	Julian Day.	Vel.	Plate.	Julian Day.	Vel.
1745	2,418,152·86	−17·8	3516	2,418,859·82	−23·8
1770	159·81	− 7·7	3517	859·84	−31·8
1779	161·81	+ 3·2	3523	864·84	−20·9
1790	171·81	−30·3	3523	864·84	−29·0
1847	182·70	− 7·2	3530	866·83	− 4·0
1879	196·67	−19·8	3559	892·71	+ 1·2
1907	218·60	+12·0	3560	892·73	− 0·1
1908	218·62	+12·3	3587	895·76	+ 0·3
1908	218·62	+12·5	3572	896·76	+ 0·2
1919	220·62	+15·0	3573	896·78	− 1·6
1919	220·62	+13·0	3579	903·69	−11·0
1921	224·71	− 7·9	3580	903·71	−12·6
1927	227·65	− 9·9	3588	910·77	− 7·7
1962	259·55	− 9·3	3589	910·79	− 6·0
1976	267·50	− 4·1	3676	934·79	+ 8·0
2027	292·52	−19·9	3715	952·66	+ 2·2
2041	294·54	−13·9	3715	952·66	+ 2·8
2051	297·52	−19·0	3716	952·68	− 6·6
2103	314·47	−26·4	3716	952·68	− 1·0
2135	322·45	−27·9	3724	955·63	− 5·2
2617	492·85	−14·7	3746	962·63	−21·0
2624	494·83	−32·6	3789	978·57	−16·8
2630	495·81	−22·2	3813	9,011·52	− 7·0
2642	497·78	−32·0	3838	015·46	− 7·9
2653	501·85	−25·3	3855	018·50	−21·3
2659	502·77	−26·9	3897	028·63	+ 9·1
2669	508·72	−29·2	4504	278·66	− 5·7
2681	515·84	+ 0·5	4515	280·69	−18·4
2694	518·85	−19·7	4525	284·73	−10·0
2706	521·76	−15·0	4528	286·67	−15·0
2712	522·76	− 7·7	4537	292·61	− 6·0
2726	525·78	−15·1	4555	293·64	−18·4
2726	525·78	−20·8	4563	298·65	− 5·9
2743	529·87	−18·6	4588	302·63	− 8·7
2752	537·76	−14·2	4611	319·58	− 0·3
2768	545·68	−17·6	4622	320·60	+ 6·0
2768	545·68	−17·7	4629	322·57	+ 4·5
2773	546·67	− 4·2	4639	323·56	+ 9·2
2802	570·69	+14·6	4657	329·56	− 9·1
2802	570·69	+ 4·4	4660	334·57	−11·1
2819	574·57	+ 7·9	4663	337·53	−15·1
2822	577·63	−11·5	4692	354·51	− 5·7
2867	588·60	− 9·0	4706	363·50	− 0·5
2901	600·65	−11·8	4702	368·48	−11·7
2910	607·52	− 5·9	4712	377·51	− 8·6
2933	619·51	− 0·5	4724	384·52	+ 0·2
2960	629·46	− 6·0	4725	389·50	− 3·4
2967	634·49	−10·4	4726	390·47	− 8·0
2968	634·51	− 2·1	4736	391·50	− 9·0
2972	637·51	+13·8	5109	600·80	− 7·5
2972	637·51	+15·4	5117	603·78	− 2·3
2972	637·51	+ 1·6	5125	607·80	−12·2
2980	640·53	−14·5	5130	608·80	−20·8
2987	642·44	− 5·9	5134	613·81	−11·3
3478	832·83	−30·4	5195	662·72	−10·0
3500	851·83	− 7·5	5203	673·68	−15·9
3504	852·83	−14·9	5216	680·65	−11·9
3508	857·82	−42·4	5240	692·61	+ 5·2
3508	857·82	−27·1	5256	697·61	− 0·4
3509	857·84	−23·2	5262	706·56	−12·8

MEASURES OF γ AQUARII.

λ	1745		1770		1770*		1770*		1779		1779*		1779*	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	− 30·62	¼	− 21·63	¼					− 14·36	½	− 18·86	½	− 36·00	¼
4549·763	− 32·63	1	+ 17·93	1			+ 5·54	1	− 3·13	½			− 20·10	½
4481·400	− 39·71	1	+ 14·62	1	− 11·97	1	− 8·06	1	− 3·68	1½	− 13·12	½	− 20·60	½
4340·634	− 38·11	1	− 24·12	1½	− 29·44	1	− 26·62	1½	− 7·52	1½	− 23·70	1	− 33·82	½
4233·462	− 8·68	½							+ 7·52	½			− 1·83	½
4101·890	− 19·53	½	− 22·74	½			− 44·18	1	− 16·49	1	− 16·93	½		
4026·352									− 2·02	1			− 11·76	¼
3933·825														
Weighted mean	− 31·11		− 6·69		− 20·72		− 19·25		− 6·20		− 19·26		− 20·04	
V_a	+ 13·73		+ 10·61		+ 10·61		+ 10·61		+ 9·72		+ 9·72		+ 9·72	
V_d	− ·16		− ·09		− ·09		− ·09		− ·09		− ·09		− ·09	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 17·8		+ 3·6		− 10·5		− 9·0		+ 3·2		− 9·9		− 10·7	

*Check measures.

MEASURES OF γ AQUARII—*Continued.*

λ	1790		1790*		1847		1879		1907		1908		1908*	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	− 51·36	½	− 43·24	¼										
4549·766			− 14·57	½	+ 0·48	1			+ 13·97	½				
4481·400	− 50·53	1	− 8·40	¼	− 11·63	1	− 11·74	1	+ 44·31	1	+ 34·53	1	+ 29·80	1
4340·634	− 50·34	1	− 33·83	½	− 11·48	1	− 13·68	¼	+ 23·28	½	+ 14·61	¼		
4233·462									+ 10·68	¼				
4101·890	− 17·53	½			− 0·35	½					+ 6·44	¼		
3933·825														
Weighted mean	− 45·10		− 24·74		− 6·51		− 12·13		+ 29·16		+ 29·03		+ 29·80	
V_3	+ 5·01		+ 5·01		− 0·41		− 7·30		− 16·89		− 16·89		− 16·89	
V_4	− ·16		− ·16		± ·00		− ·07		+ ·02		− ·09		− ·09	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 40·5		− 20·2		− 7·2		− 19·8		+ 12·0		+ 12·3		+ 12·5	

*Check measures.

MEASURES OF γ AQUARII—*Continued.*

λ	1919		1919*		1921		1927		1962		1976		2027	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	.....		.....		.....		.....		− 3·77	½	+ 10·61	½	+ 6·40	½
4549·766	.....		.....		.....		.....		.....		+ 40·52	¼	+ 6·89	¼
4481·400	+ 35·22	1	+ 36·58	1½	+ 14·38	1	+ 12·31	1½	+ 37·18	1	+ 25·73	1	+ 13·96	1½
4340·634	+ 31·22	1	+ 16·53	½	+ 10·34	1	+ 9·50	¾	+ 19·73	1	+ 17·48	1½	+ 24·67	½
4101·890	.....		+ 29·79	¼	.....		.....		+ 14·93	1	+ 19·84	¼	+ 4·29	¼
3933·825	.....		.....		.....		.....		.....		+ 14·91	1	+ 6·07	1
Weighted mean	+ 33·22		+ 31·48		+ 12·36		+ 11·37		+ 19·99		+ 24·93		+ 8·83	
V_a	− 18·12		− 18·12		− 19·75		− 20·85		− 28·87		− 29·65		− 28·21	
V_d	− ·04		− ·04		− ·22		− ·13		− ·12		− ·04		− ·20	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 15·0		+ 13·0		− 7·9		− 9·9		− 9·3		− 4·1		− 19·9	

*Check measures.

MEASURES OF γ AQUARII—*Continued.*

λ	2041		2051		2103		2135		2617		2624		2630	
	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt
4861·527	.....		.....		− 5·38	½	− 8·31	½	− 62·19	½	− 91·20	¼		
4549·766	.....		.....		− 4·84	1	.....		− 37·26	¼				
4481·400	+ 19·15	1	+ 15·61	1	− 8·09	1½	− 2·34	1	− 26·97	1	− 57·76	1	− 56·23	1
4471·676	+ 13·54	1	.....		.....		.....		− 8·93	¼				
4340·634	.....		.....		+ 11·44	¼	− 27·72	¼	− 37·05	¼	− 54·01	1	− 30·12	¼
4101·890	.....		.....		.....		.....		− 41·29	½	− 48·21	½	− 23·24	¼
3933·825	+ 10·28	1	+ 1·06	1	+ 2·50	1	.....		− 53·34	¾	− 45·80	½	− 44·56	½
Weighted mean	+ 14·32		+ 8·34		− 3·37		− 7·72		− 37·50		− 55·21		− 44·17	
V_a	− 27·66		− 26·83		− 22·52		− 19·64		+ 23·06		+ 22·87		+ 22·15	
V_d	− ·25		− ·22		− ·22		− ·23		± ·00		+ ·02		+ ·09	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 13·9		− 19·0		− 26·4		− 27·9		− 14·7		− 32·6		− 22·2	

MEASURES OF γ AQUARII.—*Continued.*

	2642		2653		2659		2669		2684		2694		2706	
λ														
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4864·527	53·69	½	54·98	½			0·09	½	3·25	½	35·26		11·38	½
4549·760					44·42	½								
4481·409	46·79	1	40·58	1	66·28	½	40·58	½			21·43	½	24·68	1
4340·634	57·24	1	46·46	1	25·4	½	3·62	1	− 12·81	1	32·82	1	36·82	1½
4128·211	− 26·58	½												
4101·899	− 38·12	½	− 36·01	½	50·89	½	5·76	½	11·71	1	25·02	½	21·48	½
4045·975			− 79·40	½										
3970·177	54·86	½					7·03	½						
3933·825	40·01	½	57·24	1			58·39	1	− 18·71	½	14·74	½	− 20·05	½
Weighted means	52·51		45·18		46·51		46·62		− 13·83		32·82		27·22	
V_1	20·71		− 20·14		− 19·81		− 17·58		+ 14·70		13·41		− 12·56	
V_2	− ·12		− ·02		− ·12		− ·16		− ·09		·12		− ·02	
Curv.	·28		·28		·28		·28		− ·28		·28		·28	
Radial Velocity	32·0		25·3		26·9		29·2		+ 0·5		19·7		15·0	

MEASURES OF γ AQUARII—*Continued*

λ	2712		2726		2726*		2743		2752		2768		2768*	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	− 11·70	½	.....		− 51·45	¼	− 38·31	¼	− 14·75	½				
4549·766	.....		.....		.....		− 35·40	¼	− 26·22	¼				
4481·400	− 12·59	½	− 25·44	1	− 25·69	1	− 26·08	1	− 11·07	½	− 9·03	1	− 8·14	1
4395·280	.....		.....		− 54·72	½	.....		.....		− 26·04	½	− 27·24	½
4340·634	− 17·66	½	− 26·78	1	− 28·39	1	− 26·31	1	− 15·12	1	− 21·46	1	− 23·77	1
4300·211	.....		.....		.....		.....		.....		− 29·48	½		
4233·328	.....		.....		.....		.....		.....		− 26·12	½		
4101·890	− 25·63	½	.....		− 5·66	½	− 17·47	½	− 29·76	½	− 1·44	½	− 17·67	½
3970·177														
3933·825	− 25·25	1												
Weighted mean	− 19·68		− 26·11		− 31·90		− 26·52		− 18·68		− 18·01		− 18·16	
V_3	+ 12·24		+ 11·37		+ 11·37		+ 8·41		+ 4·61		+ 0·73		+ 0·73	
V_4	+ ·01		− ·04		− ·04		− ·21		− ·06		+ ·06		+ ·06	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 7·7		− 15·1		− 20·9		− 18·6		− 14·2		− 17·6		− 17·7	

*Check measures

MEASURES OF γ AQUARII—[illegible]

λ	2773		2802		2802*		2819		2822		2867		290[illegible]	
	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt
4861·527	......		.....		.....		.....		− 0·48	½	+ 7·85	[illegible]		
[illegible]49·766	5·86	½	.....		.....		+ 19·69	1½	− 18·38	½	− 1·46	¼		
[illegible]481·400	− 5·60	½	+ 16·92	1	+ 30·02	1	+ 37·53	¼	− 1·91	1	+ 7·33	1	+ 14·14	1
[illegible]40·634	− 3·23	1½	+ 8·77	1	+ 21·46	1	+ 18·81	1	+ 3·70	1	+ 18·69	1½	+ 8·67	1
[illegible]25·939	......		......		......		......		+ 14·07	½				
4128·211	......		+ 21·82	¾	......		......		+ 3·75	1	+ 6·05	1	+ 11·53	[illegible]
4101·890	......		+ 29·86	¼	+ 32·35	¼								
[illegible]·177														
[illegible]			[illegible] 12·09	1					[illegible] 15·79	[illegible]			+ 13·88	1
Weighted mean	4·23		16·25		+ 26·47		+ 20·97		+ 3·44		+ 10·50		+ 12·13	
V.	− 0·23		11·49		11·49		13·07		14·65		19·17		23·51	
V.	− ·06		·09		·09		+ ·09		·03		·02		− ·17	
[illegible]	·28		·28		·28		·28		·28		·28		·28	
Radial Velocity	4·2		− 4·4		+ 14·6		+ 7·9		− 11·5		− 9·0		− 11·8	

*[illegible]

MEASURES OF γ AQUARII—*Continued*

λ	2910		2933		2960		2967		2968		2972		2972*	
	Vel	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt
1861·527	+ 34·69	½	+ 57·30	½	+ 32·60	½	+ 18·63	½	+ 31·96	½				
1549·766	+ 23·88	½	+ 9·58	½	.....		.....		+ 23·88	½				
1481·400	+ 10·07	1½	+ 40·32	½	+ 25·25	1	+ 12·76	1½	+ 30·82	1½	+ 48·03	1	+ 40·80	1½
1340·634	+ 31·44	1½	+ 32·89	1	+ 19·56	1	+ 19·55	1	+ 31·70	1½	+ 32·95	1	+ 21·40	1
4233·328	.....		+ 4·37	½										
4101·890	+ 16·06	1	+ 28·28	½	+ 27·65	½	+ 30·53	½	+ 16·09	½	+ 47·14	½	+ 28·76	½
4045·975	.....		.....		+ 26·38	½								
3970·177														
3933·825	+ 12·61	1	.....		+ 13·98	½	+ 24·21	1	+ 18·56	1	+ 29·58	1	+ 30·87	1½
Weighted mean	+ 19·87		+ 28·19		+ 23·78		+ 18·80		+ 27·11		+ 44·04		+ 31·84	
V_1	− 25·52		− 28·18		− 29·46		− 28·87		− 28·87		− 29·85		− 29·85	
V_2	+ ·04		− ·22		± ·00		− ·09		− ·09		− ·10		− ·10	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 5·9		− 0·5		− 6·0		− 10·4		− 2·1		+ 13·8		+ 1·6	

*Check measures

MEASURES OF γ AQUARII.—*Continued*

λ	2072*		2980		2987		3478		3500		3504		3508	
	Vel	Wt	Vel	Wt	Vel	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt	Vel.	Wt
4861·527			+ 43·68	½	+ 29·39	½					− 22·76	½	− 77·10	½
4549·766									− 23·41	½				
4481·400	+ 53·17	1½	+ 15·69	1	+ 20·91	1	− 57·75	½	− 36·25	½	− 32·69	½	− 56·89	½
4352·006					+ 22·83	½								
4340·634	+ 28·35	1½	+ 7·87	1	+ 14·46	½	− 59·32	½	− 38·43	½	− 47·78	1	− 52·62	½
4101·890	+ 52·62	1	+ 20·11	¼	+ 28·57	1					− 51·84	¼	− 56·64	½
3933·825	+ 53·18	1	+ 20·36	1½	+ 32·99	½					− 38·68	½	− 83·66	½
Weighted mean	+ 45·62		+ 15·77		+ 23·85		− 58·54		− 31·98		− 39·20		− 65·38	
V_o	− 29·85		− 29·85		− 29·79		+ 28·29		+ 24·76		+ 24·52		+ 23·14	
V_d	− ·10		− ·16		+ ·04		+ ·12		+ ·04		+ ·09		+ ·09	
Corr	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 15·4		− 14·5		− 5·9		− 30·4		− 7·5		− 14·9		− 42·4	

*Check measures

MEASURES OF γ AQUARII—*Continued*

λ	3508*		3509		3516		3517		3523		3534*		3530	
	Vel.	Wt.	Vel.	Wt	Vel.	Wt	Vel.	Wt	Vel	Wt	Vel	Wt	Vel	Wt
4861·527	− 76·14	½	− 55·75	½	67·16	½			− 20·04	½				
4549·766	43·26	½					− 52·40	½						
4481·400	48·72	½	− 73·01	½	56·86	1	− 55·71	½	− 41·21	½	− 48·46	½		
4340·634	43·04	1	− 30·35	½	31·27	1			− 37·50	½	− 51·01	½	− 30·93	½
4101·890	42·43	½	47·23	½	− 21·98	½			− 42·62	½	51·84	½	− 22·08	½
3933·825	50·42	½	− 52·31	½	− 44·27	½			− 44·96	½	47·92	½	− 21·47	1
Weighted mean	− 50·03		− 46·07		− 46·09		54·06		− 41·57		− 49·70		− 23·98	
V_o	+ 23·14		+ 23·14		+ 22·53		− 22·53		· 20·91		+ 20·91		+ 20·23	
V_d	+ ·09		+ ·04		± ·00		00		+ ·03		+ ·01		± ·00	
Curv.	− ·28		− ·28		− ·28		28		− ·28		− ·28		− ·28	
Radial Velocity	− 27·1		− 23·2		− 23·8		− 31·8		− 20·0		− 29·0		− 4·0	

*Check measures

MEASURES OF γ AQUARII—*Continued*

λ	3559		3560		3567		3572		3573		3579		3580	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·327	− 9·30	½	+ 0·16	½	− 7·85	½					− 11·38	½	− 8·66	½
4549·766	..												− 26·47	¼
4481·400	− 9·63	½	− 9·92	¼	− 16·79	¼	+ 5·60	½			− 16·54	½	− 17·68	¼
4340·634	+ 2·54	1	− 11·51	1	− 8·19	1	− 15·69	1	− 11·77	1	− 16·62	1	− 11·66	1
4101·890	− 12·67	½							− 9·50	½	− 15·07	¼		
3933·825	− 15·00	1	− 15·42	½	+ 5·14	¼	− 3·23	½	+ 2·65	½	− 14·09	½	− 32·16	¼
Weighted mean	− 8·45		− 9·52		− 7·51		− 7·25		− 8·98		− 15·06		− 16·58	
V_2	· 9·51		· 9·54		· 8·10		· 7·65		+ 7·65		+ 4·29		· 4·29	
V_4	· 12		· ·12		·00		· ·04		· ·04		+ ·09		· ·07	
Curv.	·28		·28		·28		·28		·28		− ·28		·28	
Radial Velocity	· 1·-		— 0·1		+ 0·3		· 0·4		− 1·6		− 11·0		− 12·6	

MEASURES OF γ AQUARII—*Continued*

λ	3588		3589		3676		3715		3716		3715*		3716*	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
1861·527			− 9·63	½	+ 9·46	½	+ 18·27	½	.....		+ 17·31	½		
1549·766	.....		− 11·84	½	.....		.....		+ 3·46	½	.....		+ 7·05	½
1481·400	.....		.....		+ 26·33	½	+ 28·11	1½	+ 17·81	1	+ 27·48	1½	+ 22·00	1½
1340·634	− 15·35	1	− 5·65	1	+ 25·85	1	+ 13·73	1	+ 11·08	½	+ 16·16	1	+ 7·15	½
1101·800	− 3·55	½	− 1·82	½	+ 25·25	½								
3933·825	− 3·07	1	.....		+ 4·23	½								
Weighted mean	− 8·08		− 6·37		+ 19·49		+ 21·34		+ 12·54		+ 22·01		+ 18·27	
V_o	+ 0·80		+ 0·80		− 10·96		− 18·76		− 18·76		− 18·76		− 18·76	
V_d	− ·12		− ·18		− ·25		− ·14		·14		·14		− ·14	
Curv.	− ·28		− ·28		− ·28		− ·28		·28		− ·28		− ·28	
Radial Velocity	− 7·7		− 6·4		+ 8·0		+ 2·2		− 6·6		+ 2·8		− 1·0	

*Check measures

MEASURES OF AQUILA

λ	3724		3746		3780		3815		3868		3896		3907	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
1801·527									− 15·62				− 12·47	
1549·799							− 12·74	4						
1481·400	− 12·74	1½	+ 1·02	3	− 17·11	1	− 24·31	1	− 29·71	1	− 9·65	4	− 46·16	1
1495·286	− 12·37	2												
1440·634	− 15·61	1	+ 2·43	1	− 7·52	1	− 26·14		− 38·05	1	+ 1·51	1	− 29·97	
1401·899			+ 2·98		− 2·54		− 21·19				− 15·84		− 14·49	
1370·177													− 14·49	
2033·825	− 23·95	1									− 7·81	4	+ 26·37	
Weighted														
mean	− 15·10		+ 1·87		− 10·37		− 25·07		− 29·71		− 8·02		− 36·64	
V_1	19·02		− 22·44		26·95		29·60		29·55		28·89		− 37·14	
V_2	·09		− ·11		·10		·16		− ·09		·16		− ·09	
V_4	·28		·28		·28		·28		·28		·28		− ·28	
Curv	·28		·28		·28		·28		·28		·28		·28	
Radial Velocity	5·2		21·0		16·8		7·0		0·0		21·3		+ 9·1	

MEASURES OF γ AQUARII (*Continued*)

λ	4504		4515		4525		4528		4537		4555		4563	
	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt	Vel	Wt
1861·527			29·17	½	6·09	½	29·68	½					+ 13·11	½
1549·766			20·08	½			24·60	½					5·32	½
1481·400	− 11·45	1	− 22·77	½	− 5·47	1	− 0·80	1	− 4·71	½	. . .		+ 4·06	½
1340·634	+ 1·39	1	− 10·27	1	− 15·46	½	− 12·35	½	+ 4·73	1	− 7·37	½	+ 6·35	½
1128·211	. . . .		. . . .		− 1·66	½	. . . .				− 13·31			
1101·800			− 15·36	½										
933·825	. . . .		− 12·85	½	− 6·96	½	. . . .		+ 1·58	½	. . . .		+ 3·81	½
Weighted mean	− 5·03		− 16·66		− 6·07		− 10·24		+ 1·64		− 10·30		+ 4·64	
V_3	− 0·52		− 1·53		− 3·52		− 4·49		− 7·41		− 7·80		− 10·31	
V_4	+ ·09		+ ·03		− ·09		+ ·02		+ ·08		+ ·04		± ·00	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 5·7		− 18·4		− 10·0		17·0		6·0		− 18·4		− 5·9	

MEASURES OF γ AQUARII—*Continued.*

λ	4588		4611		4622		4629		4639		4657		4660	
	Vel	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527			+ 2·72	¼	+ 15·22	½	+ 11·21	½	+ 29·37	½	+ 3·68	½	+ 11·71	½
4549·766							+ 38·04	¼			+ 20·75	¼	+ 2·80	¼
4481·400	+ 11·83	½	+ 23·91	1	+ 24·68	1	+ 29·89	½	+ 20·64	½	+ 18·19	1	+ 9·43	1
4340·634	− 2·42	½	+ 15·69	1	+ 31·27	1	+ 25·27	1	+ 28·90	1			+ 25·66	½
4101·890							+ 29·57	½	+ 32·23	½				
3933·825	+ 1·82	½	+ 25·86	½	+ 29·30	½	+ 24·12	½	+ 36·31	1	+ 13·02	¼	+ 20·19	¼
Weighted mean	+ 3·75		+ 19·35		+ 26·07		+ 25·28		+ 30·38		+ 14·22		+ 13·75	
V_0	− 12·16		− 19·42		− 19·82		− 20·55		− 20·92		− 23·00		− 24·56	
V_2	+ ·04		+ ·02		− ·02		+ ·02		+ ·04		± ·00		± ·00	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 8·7		− 0·3		+ 6·0		+ 4·5		+ 9·2		− 9·1		− 11·1	

MEASURES OF γ AQUARII—*Continued.*

λ	4663		4692		4700		4702		4712		4724		4725	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	.....	.....	+ 18·95	½	.....	.....	+ 38·45	¼	.....	.....	+ 30·35	½	.....	.....
4549·766	.....	.....	+ 30·95	¼	+ 29·21	¼	.....	.....	.....	.....	.....	.....	.....	.....
4481·400	.....	.....	+ 16·59	½	+ 29·60	1	+ 21·93	½	+ 28·69	½	+ 24·99	1	+ 18·62	½
4340·634	+ 8·67	1	+ 27·65	½	.....	.....	+ 12·26	½	+ 19·21	½	+ 20·36	½	+ 32·05	½
4233·328	.....	.....	.....	.....	.....	.....	+ 22·56	¼	.....	.....	.....	.....	.....	.....
4101·890	.....	.....	+ 30·53	¼	.....	.....	.....	.....	.....	.....	+ 42·56	½	.....	.....
3933·825	+ 12·46	1	+ 22·88	½	.....	.....	+ 16·31	1	+ 16·72	½	+ 33·45	½	+ 23·69	¼
Weighted mean	+ 10·56		+ 23·46		+ 29·52		+ 19·46		+ 21·53		+ 29·45		+ 25·00	
V_o	− 25·38		− 28·86		− 29·70		− 29·86		− 29·67		− 28·78		− 27·98	
V_d	± ·00		− ·04		− ·06		− ·04		− ·16		− ·19		− ·16	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 15·1		− 5·7		− 0·5		− 11·7		− 8·6		+ 0·2		− 3·4	

MEASURES OF γ AQUARII—*Continued.*

λ	4726		4736		5109		5117		5125		5130		5134	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·527	+ 11·72	½	+ 2·41	¼	− 31·48	¼							− 12·54	¼
4549·766	+ 8·00	¼									− 40·03	½	− 26·73	¼
4481·490	+ 26·52	¼	+ 29·84	½	− 20·99	½	− 19·84	¼	− 25·69	½	− 30·6	½	− 38·03	¼
4340·734	+ 28·00	1	+ 14·35	¼	− 22·62	½							− 23·31	¼
4101·890	+ 12·71	½												
3933·825	+ 15·69	¼	+ 19·05	½	− 29·26	1			− 30·75	½	− 40·45	¼	− 23·05	¼
Weighted mean	+ 19·18		+ 19·09		− 26·20		− 19·84		− 28·22		− 36·37		− 24·73	
V_a	− 27·80		− 27·59		+ 18·97		+ 17·84		+ 16·25		+ 15·85		+ 13·74	
V_d	− ·13		− ·20		+ ·04		+ ·04		± ·00		+ ·01		+ ·06	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		+ ·28	
Radial Velocity	− 8·0		− 9·0		− 7·5		− 2·3		− 12·2		− 20·8		− 11·3	

MEASURES OF γ AQUARII—*Concluded.*

λ	5195		5203		5216		5240		5256		5262			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	.....	.....	.....	.....	+ 4·39	½	.....	.....	.....	.....	.....	.....	.....	.....
4481·400	− 5·72	½	+ 6·36	1	+ 13·36	½	+ 36·38	¼	+ 18·44	¼	+ 10·18	½	.....	.....
4340·634	+ 10·04	½	.....	.....	+ 7·85	¼	+ 9·00	¼	+ 22·96	½	+ 17·66	½	.....	.....
4101·890	− 7·87	¼	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3933·825	− 3·15	½	− 7·79	1	− 7·96	¼	+ 36·60	¼	+ 27·44	½	.....	.....	.....	.....
Weighted mean	+ 0·03		− 0·72		+ 6·20		+ 27·33		+ 23·85		+ 13·92			
V_0	− 9·75		− 14·79		− 17·76		− 21·77		− 23·90		− 26·37			
V_2	− ·16		− ·12		− ·09		− ·07		− ·09		− ·04			
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28			
Radial Velocity	− 10·2		− 15·9		− 11·9		+ 5·2		− 0·4		− 12·8			

Dominion Observatory,
Ottawa,
March, 1913.